

Patent claims

1. A method for operating an image system (10) of  
an imaging medical examination device (1), the  
5 image system (10) having a reception unit (11)  
for receiving a plurality of signals arising at  
different locations, and a display unit (19) for  
the imaging representation of pixels, the pixels  
each being assigned at least one signal,  
10 characterized in that  
an event of the undisturbed operation of the  
medical examination device (1) automatically  
triggers a defect determination (63) for  
determining a defective pixel possibly present  
15 in the image.
2. The method as claimed in claim 1,  
characterized in that  
the triggering event is derived from an  
20 operating process which does not serve for the  
defect determination (63), in particular from an  
operator's control process which does not serve  
for the defect determination (63).
- 25 3. The method as claimed in claim 1 or 2,  
characterized in that  
the triggering event is derived from a switch-on  
process performed on the medical examination  
device (1).
- 30 4. The method as claimed in one of claims 1 to 3,  
characterized in that  
the triggering event is derived from a  
calibration process performed on the medical  
35 examination device (1).
5. The method as claimed in one of claims 1 to 4,  
characterized in that

the triggering event is generated at a defined point in time before, during or after an image acquisition procedure, in particular before, during or after a patient examination or a scan.

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6. The method as claimed in one of claims 1 to 5, characterized in that the triggering event is generated by a counting process.

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7. The method as claimed in claim 6, characterized in that the counting process counts a process which is repeated during operation of the medical examination device (1), in particular a switch-on process, a calibration process and/or examination process.

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8. The method as claimed in one of claims 1 to 7, characterized in that the triggering event is generated by a time measuring process.

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9. The method as claimed in one of claims 1 to 8, characterized in that after the defect determination (63), a correction process (67) is automatically triggered if a defective pixel was detected.

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10. The method as claimed in claim 9, characterized in that during the correction process (67), the assignment of the defective pixel to its signal is canceled and, instead of this, the pixel is assigned one or more signals of one or more other pixels.

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11. The method as claimed in claim 9 or 10,

characterized in that  
in connection with the defect determination  
after carrying out a first correction process in  
which already known image defects are corrected,  
5 the corrected image is analyzed in order to  
determine further defects or defects that are  
still present, which are corrected in a second  
correction process.

10 12. The method as claimed in claim 11,  
characterized in that  
the image is filtered after the first correction  
process, after which the filtered image is  
analyzed.

15 13. The method as claimed in claim 12,  
characterized in that  
a median filter or a high-pass filter is used as  
the filter.

20 14. The method as claimed in one of claims 11 to 13,  
characterized in that  
in the context of the analysis, the pixel-  
related signals are compared with one or more  
25 threshold values.

15. The method as claimed in one of claims 11 to 14,  
characterized in that  
the analysis result is used to generate a new  
30 defect map (53), which describes the detected  
defect or defects that is or are new or still  
present, and which is used to effect the  
correction in the second correction process.

35 16. The method as claimed in one of claims 11 to 15,  
characterized in that  
in the context of the first correction process,  
the image is corrected using an old defect map

(50), which describes already known defects.

17. The method as claimed in claims 15 and 16,  
characterized in that  
5 the old defect map (50) is updated using the new  
defect map (53).
18. The method as claimed in claim 17,  
characterized in that  
10 the updating is effected only when one or more  
defects that are new or still present are  
detected.
19. The method as claimed in one of claims 11 to 18,  
15 characterized in that  
a flat-fielding correction of the image is  
effected in the context of the first correction  
process.
- 20 20. The method as claimed in one of claims 1 to 19,  
characterized in that  
after the defect determination (63), a message  
is automatically sent via a data link (47) to a  
service device (49) if a defective pixel was  
25 detected.
21. The method as claimed in one of the preceding  
claims,  
characterized in that  
30 a pixel is detected as defective if the assigned  
signal falls below a minimum value.
22. The method as claimed in one of the preceding  
claims,  
35 characterized in that  
a pixel is detected as defective if the noise in  
the assigned signal exceeds a maximum value.

23. The method as claimed in one of the preceding  
claims,  
characterized in that  
the defect determination (63) is carried out on  
a stored image.
24. An imaging medical examination device (1) having  
an image system (10), the image system (10)  
having a reception unit (11) for receiving a  
plurality of signals arising at different  
locations, and a display unit (19) for the  
imaging representation of pixels, the pixels  
each being assigned at least one signal,  
characterized by  
a detection device (31) for automatically  
determining a defective pixel possibly present  
in the image, in which case the detection device  
(31) can be activated by an event of the  
undisturbed operation of the medical examination  
device (1).
25. The examination device as claimed in claim 24,  
characterized in that  
the detection device (31) can detect a pixel as  
defective if the assigned signal falls below a  
minimum value.
26. The examination device as claimed in claim 24 or  
25,  
characterized in that  
the detection device (31) can detect a pixel as  
defective if the noise in the assigned signal  
exceeds a maximum value.
27. The examination device as claimed in one of  
claims 24 to 26,  
characterized by  
a correction device (41) for automatically

eliminating a defective pixel that has possibly  
been detected, in which case the correction  
device (41) is connected to the detection device  
(31) and can be activated by the latter if a  
defective pixel is detected.

28. The examination device as claimed in claim 27,  
characterized in that  
the detection device (31) is designed for  
analysis of the image that has been corrected in  
the correction device (41) a first time with  
regard to already known defects, for the purpose  
of determining defects that are new or still  
present, and the correction device (41) is  
designed for renewed correction of the corrected  
image with regard to the defect or defects that  
is or are new or still present.

29. The examination device as claimed in claim 28,  
characterized in that  
the detection device (31) has a filter for  
filtering the image after the first correction  
process and an analysis means (42) for  
determining one or more defects that is or are  
new or still present.

30. The examination device as claimed in claim 29,  
characterized in that  
the filter is a median filter or a high-pass  
filter.

31. The examination device as claimed in one of  
claims 28 to 30,  
characterized in that  
the analysis means (42) is designed for  
comparing the pixel-related signals with one or  
more threshold values for the purpose of  
determining a defect.

32. The examination device as claimed in one of  
claims 28 to 31,  
characterized in that  
the analysis means (42) or the detection device  
5 (31) is designed for generating a new defect map  
(53), which describes the detected defect or  
defects that is or are new or still present, and  
the correction device (41) is designed for  
correcting the image in the second correction  
10 process using the new defect map (53).
33. The examination device as claimed in one of  
claims 28 to 32,  
characterized in that  
15 the correction device (41) is designed for  
correcting the image using an old defect map  
(50), which describes already known defects, in  
the context of the first correction process.
- 20 34. The examination device as claimed in claims 32  
and 33,  
characterized in that  
the detection device (31) or the correction  
device (41) is designed for updating the old  
25 defect map (50) using the new defect map (53).
35. The examination device as claimed in one of  
claims 28 to 34,  
characterized in that  
30 the correction device (41) is designed for  
carrying out a flat-fielding correction of the  
image in the context of the first correction  
process.
- 35 36. The examination device as claimed in one of  
claims 24 to 35,  
characterized in that  
the detection device (31) has a data interface

(45) for sending a message to a service device (49), in which case the message can be sent automatically by the detection device (31) if a defective pixel is detected.

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37. The examination device as claimed in one of claims 24 to 36, characterized in that the detection device (31) is connected to an image memory (40), from which it is possible to retrieve an image which was generated by the image system (10) at an earlier point in time.

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